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ABSTRACT

Between 40% and 50% of Chemistry 103 registrants at the University of Maryland at College Park earn D, F, or W grades. Registrants for Chemistry 103 were randomly selected to participate in a pre-course refresher consisting of listening to as many as seven audio-tutorial tapes on the basic concepts and calculations of chemistry. Records were kept of who listened to tapes and how many tapes each student requested. Chemistry 103 final grades were examined for three groups: (1) students (N=13) who listened to at least one tape (users); (2) students (N=34) who were asked to participate but who chose not to listen to tapes (nonusers); and (3) a nontreatment comparison group (N=49). The results revealed that 64% of users earned a final grade of A or B or C while only 45% of nonusers and comparisons received at least a C grade; the difference was not statistically significant. There were no differences among groups in terms of academic persistence. These findings support further study of the use of audio-tutorial tapes on the basic concepts of chemistry prior to taking the chemistry course as an effective way to help students do well in chemistry. The fact that students who chose to use the tapes also earned higher grades in other courses, however, suggests that motivation and academic ability may account for performance differences in Chemistry 103.
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AUDIO-TUTORIAL TAPES

AS AIDS TO COLLEGE CHEMISTRY PRE-REGISTRANTS:

A PILOT STUDY

Research Report # 6-86

The Counseling Center Retention Study Group*

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Summary

Fifty registrants for college Chemistry (CHEM 103) were randomly selected to participate in a pre-course refresher consisting of listening to as many as seven audio-tutorial tapes on the basic concepts and calculations of chemistry. Sixty-four percent (64%) of those who chose to listen to at least one of the tapes earned a final course grade of A or B or C while only 45% of non-users received at least a C grade. There were no differences among groups in terms of academic persistence. The results support further study of the hypothesis that offering college chemistry registrants an opportunity to listen to audio-tutorial tapes on the basic concepts of chemistry prior to their taking the chemistry course is an effective way to help them do well in chemistry. However, the fact that the students who chose to use the tapes also earned higher grades in other courses suggests that motivation and academic ability may account for performance differences in Chemistry 103.

* Vivian Boyd, Steven Carstens, Patricia Hunt, Stanley Hunt, Brian McLaren, Thomas Magoon.

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Chemistry 103 is a required entry level course for a number of different majors at the University of Maryland at College Park. It is also a course with a remarkably high incidence of D, F, or W grades: typically between 40% and 50% of Chemistry registrants earn such grades.

A retention intervention was devised to test the hypothesis^{1.} that listening to audio-tutorial tapes pertaining to the basic concepts of chemistry, prior to taking Chemistry 103, would have a positive impact on final grade for the course and on persistence in the course. It was further hoped that such an impact would carry over to general academic performance and to retention in higher education.

METHOD

From a listing of Chemistry 103 registrants for Spring 1984, 50 students for the experimental group and 50 for the nontreatment comparison group were randomly selected from the names of those students with a local phone number.

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1. Educulture's Chemistry Series
by Colin Davies and Gordon MacLeod

* Vivian Boyd, Steven Carstens, Patricia Hunt, Stanley Hunt,
Brian McLaren, Thomas Magoon.

A letter of invitation was sent from the Chemistry Department in early January 1984 to the 50 experimental group members. Included with the letter was a brochure which alerted the students of the "facts of life" of Chemistry 103: that the previous spring semester 49% of students enrolled in CHEM 103 either failed the class, received a final grade of D, or withdrew from the class. The brochure described audio-tutorial tapes available in the Counseling Center's Learning Assistance Service and suggested the use of the tapes as a means of refreshing their recall of basic chemistry concepts and calculations. The invitational letter was followed by a phone call attempt to see if the student had received the letter and to ascertain if the student was considering listening to the tapes. The Service kept records of who listened to tapes and how many tapes each participant requested.

Students in the comparison group did not receive an invitational letter and did not have access to the audio-tutorial tapes.

Outcome Variables

There were three outcome variables studied to determine the effect of the intervention on subject retention rates:

(1) academic persistence, defined as registered for and completed a given semester;

(2) persistence in good standing, defined as registered for and completed a given semester, and with no academic action taken as a result of that semester;

(3) semester grade point average, as determined by the University three weeks following the end of a given semester.

All data concerning registration status, academic action, and grade point average, were obtained from University records.

RESULTS

Three experimentals were dropped from the analysis: one for not leaving a forwarding address and consequently not having received the invitational letter; two for dropping Chemistry 103 during the schedule adjustment period. One subject in the comparison group was dropped from the analysis for having left the university during the schedule adjustment period.

A total of 13 students (28% of those who were sent the invitational letter) went to the Learning Assistance Service during semester break to listen to at least one audio-tutorial tape. An examination of CHEMISTRY 103 final grades for (a) users, i.e., students (n=13) who listened to at least one of the audio-tutorial tapes; (b) nonusers, i.e., students (n=34) receiving the invitational letter and choosing not to take advantage of the tapes' availability; and (c) the nontreatment comparison group (n=49), shows that 64% of the students using the tapes earned a final grade of A, B, or C, compared to 45% for the other two groups. This difference was not statistically significant, using chi square.

Table 1. Chemistry 103 Final Grade by Group

GRADE	GROUP					
	Users		Nonusers		Comparison	
	n	%	n	%	n	%
A/B/C	7	64	14	45	19	45
D/F/W	4	36	17	55	23	55

Table 2 shows academic persistence rates by group. There were no statistically significant differences among the three groups on academic persistence, using the chi square statistic.

Table 2. Academic Persistence Rates by Group

SEMESTER	GROUP					
	Users		Nonusers		Comparison	
	n	%	n	%	n	%
Spring '84	12	92	32	91	45	94
Fall '84	10	77	30	86	35	73
Spring '85	9	69	23	66	33	69
Fall '85	6	46	17	49	26	54

Table 3 shows rates of students who persisted in good standing, by group. There were no statistically significant differences among the three groups on the variable 'persisted and in good standing', using the chi square statistic.

Table 3. Academic Persistence in Good Standing Rates by Group

SEMESTER	GROUP					
	Users		Nonusers		Comparison	
	n	%	n	%	n	%
Spring '84	8	62	17	49	28	58
Fall '84	9	69	26	74	27	56
Spring '85	8	62	21	60	27	56
Fall '85	6	46	17	49	23	48

Table 4 shows semester grade point average by group. Although the grade point average for Users was higher than for the Nonusers and the Comparison group for four semesters, the differences as measured by the analysis of variance procedure did not reach significance.

Table 4. Semester Grade Point Average by Group

SEMESTER	GROUP					
	Users		Nonusers		Comparison	
	M	S.D.	M	S.D.	M	S.D.
Spring '84	2.55	1.19	2.11	.93	2.22	1.12
Fall '84	2.82	.95	2.22	.87	2.26	.92
Spring '85	2.91	.75	2.42	.71	2.26	1.05
Fall '85	3.08	.86	2.58	.68	2.42	1.05

DISCUSSION

Offering Chemistry 103 registrants an opportunity to listen to audio-tutorial tapes on the basic concepts of chemistry, during the semester break just prior to their taking the course, appears to be an effective way of helping some students do well in their Chemistry course. Students who took advantage of the tapes in the Learning Assistance Service were less likely to earn a D, F, or W grade in Chemistry. However, because tape users tended to do better in all their courses than students who did not take advantage of the tapes, and better than students in the comparison group, it is difficult to determine the extent to which motivation may have caused these differential effects. Better academic performance in all courses suggests that differences in final Chemistry grades may have been caused by

differences in ability and level of motivation and not necessarily caused by the intervention.

Further research using effective incentives and controlling for ability is needed to rule out motivation and ability as explanations for differential effects in academic performance.